(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
28 November 2002 (28.11.2002)

PCT

(10) International Publication Number
WO 02/094653 A1

(51) International Patent Classification[7]: B63C 11/20

(21) International Application Number: PCT/GB02/02271

(22) International Filing Date: 15 May 2002 (15.05.2002)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
0112244.9 18 May 2001 (18.05.2001) GB

(71) Applicant and
(72) Inventor: TOKATLIAN, Sarkis [GB/GB]; The Garden Flat, 58 Holland Road, Kensington, London, Greater London W14 8BB (GB).

(74) Agents: GREY, Ian et al.; Venner, Shipley & Co., 20 Little Britain, London EC1A 7DH (GB).

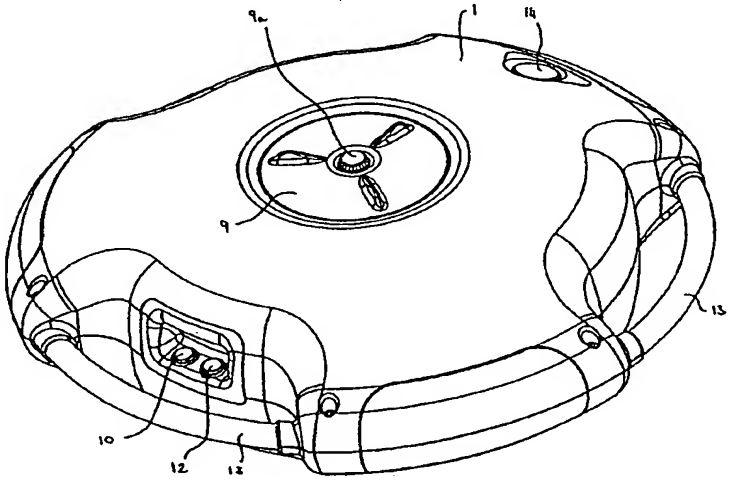
(81) Designated States *(national)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZM, ZW.

(84) Designated States *(regional)*: ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:
— *with international search report*

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: SUB AQUA BREATHING SYSTEM



(57) Abstract: A sub-aqua breathing system which enables a person operating underwater to breathe air from a compressed air tank (2) supported on the water surface. The system includes a housing (1) containing both a buoyant material (3) and a toroidal compressed air tank (2) connected to an air line (7) feeding a conventional mouthpiece regulator. The air line (7) may be coiled and stored within, or on, the housing (1). Preferably the housing (1) is of discus-like shape with the buoyant material (3) in the form of floats normally nested within the housing (1), but deployable radially outward to increase stability when the assembly is floating on the water surface.

WO 02/094653 A1

Sub-Aqua Breathing System

The present invention relates to a sub-aqua breathing system that allows a person operating underwater to breathe air from a compressed air tank supported on the water surface.

There are many occasions when it is desired to operate below the water surface, for example when freeing the propellers of water craft entangled with fishing nets, lines, or weed, etc. in rivers or streams; for the inspection of vessel hulls; for the rescue of people trapped below the water surface in swimming pools, or from cars or vessels sunk in rivers or docks; or for sporting purposes.

Normally sub-aqua or 'SCUBA' equipment can be used in such situations but it is heavy and cumbersome to operate and difficult to manoeuvre whilst wearing. 'SCUBA' equipment also takes some time to get ready for use and/or put on and this can be a serious problem in, for example, an emergency situation.

Recently there have been developments in which floating members, similar to large life buoys or rubber dinghies, are used to support a petrol engine or, batteries and an electric motor, which drive an air pump to feed a hose, possibly via an air receiver, with a mouthpiece regulator at the remote end of the hose. Such devices are cumbersome, heavy to transport, difficult to maintain and are expensive.

The present invention seeks to provide a sub-aqua breathing system that overcomes or substantially alleviates the drawbacks of the prior art described above and other known deficiencies of existing underwater breathing equipment.

According to the present invention, there is provided a sub-aqua breathing system comprising a housing containing buoyant material and a toroidal compressed air tank, said tank being connectable to an air line feeding a mouthpiece regulator.

Preferably, the buoyant material is disposed in regions around the periphery of the toroidal compressed air tank.

The housing conveniently includes a storage compartment for an air-line when not in use.

In a preferred embodiment, the system includes a base rotatably mounted to the housing to cover the storage compartment and having at least one opening therein for the passage of an air-line from the storage compartment through the base.

In an alternative embodiment, the sub-aqua breathing system including a base and a release mechanism for releasably mounting the base to the housing over the storage compartment.

Preferably, the release mechanism is a lever pivotally mounted to the housing, the lever and base including cooperating means that engage to retain the base on the housing.

The release mechanism advantageously includes spring means to bias the lever into a position in which the cooperating means are in engagement.

Preferably, the release mechanism includes a safety release pin that cooperates with the housing and the lever to prevent inadvertent operation of the release mechanism.

In a preferred embodiment, the sub-aqua breathing system includes at least one air line coiled within the storage compartment, the or each air line having one end connected, via an air flow control valve, to the toroidal compressed air tank.

Preferably, a removable cover is mounted on the housing to provide access to the interior thereof.

The housing may conveniently contain a mast with a diving pennant attached thereto, the mast being removable from the housing and mountable in a socket thereon.

In one embodiment, the buoyant material is formed from a number of circumferentially spaced floats the system including means for radially deploying the floats from the housing.

Preferably, the deployment means includes an air bag associated with each float and inflatable in response to operation of a manually operated valve to direct air from the compressed air tank to the air bags to radially deploy the air bags from the housing.

The floats are advantageously attached to spring means operable to retract the floats in response to operation of a second manually operated valve to expel the air from the air bags.

The housing preferably has a discus-like shape.

Embodiments of the present invention will now be described, by way of example only, with reference to the accompanying drawings, in which:

Figure 1 shows a top perspective view of a sub-aqua breathing system according to an embodiment of the invention;
Figure 2 shows a top plan view of the system illustrated in Figure 1;
Figure 3 shows a front view of the system illustrated in Figure 1;
Figure 4 shows a bottom plan view of the system illustrated in Figure 1;
Figure 5 shows a cross sectional view along line X-X in Figure 3;
Figure 6 shows a top perspective view of the system illustrated in Figure 1 but with the floats in their extended positions;
Figure 7 shows a bottom perspective view of a second embodiment of a sub-aqua breathing system according to the present invention;
Figure 8 shows an enlarged partial side sectional view of the release mechanism forming part of the system shown in Figure 7; and

Figure 9 shows a side view of the system shown in Figure 7 with the safety pin removed and the base plate falling away from the housing to release one or more air-lines.

With reference to the drawings, the equipment comprises a two-part, lightweight plastics, injection moulded generally circular housing 1 enclosing a toroidal compressed air tank 2. The housing also contains regions of buoyant material 3 surrounding the tank 2. The bottom part 4 of the housing has a central disc-like rotatable portion 5 with apertures 6 through one of which the air line 7 extends, the air line being coiled inside the housing 1 and fed out, or wound up inside the housing 1, by rotation of the central rotating portion 5 in opposite directions respectively. The air line 7 may be 10metres long, and can be extended by the addition of one or two additional 10metre lengths. The present embodiment (see Figure 5) is shown with only one air line 7 coiled up and extending from the housing 1. However, it will be appreciated that the housing 1 may also contain multiple air lines 7 coiled up within it.

The top part 8 of the housing has a removable central portion 9 through which access to the interior of the housing 1 may be obtained and which contains the main compressed air control valve 15 and first stage regulator 15a which reduces the pressure from the tank to an intermediate pressure which is supplied via the air line to a mouthpiece or second stage regulator (not shown) which reduces the intermediate pressure to ambient water pressure and which supplies air when the user inhales. The interior of the housing 1 may also be used to store a telescopic mast carrying the conventional 'diver working below' pennant (not shown). The mast can be removed from the interior of the housing 1 and engaged in a socket (not shown) in the top of the housing 1 or in the removable central portion 9 so that it extends vertically upwardly from the housing 1. The central portion 9 also carries a light 9a that may be controlled so that it illuminates or flashes when the assembly is in use. The light may also be used to summon assistance by flashing, in morse code, the universal SOS signal.

The top and bottom parts of the housing 8,4 are attached to each other and together form a sealed unitary component. Similarly, an "0" ring is disposed between the cover 9 and the housing 1 so that the cover 9 forms an airtight fit with the housing 1 when the cover 9 is in place. The cover 9 and housing 1 cooperate with each other with a bayonet type fitting. Nodules 9b are formed on the upper surface of the cover to enable the user to manipulate the cover 9 and attach it or remove it from the housing 1. The air trapped inside the airtight housing 1 provides additional buoyancy to that provided by the buoyant material.

The buoyant material may be a single body within the housing outside the toroidal air tank 2, or a number of separate floats 3 equally spaced about the periphery of the toroidal tank 2 and having their radially outer surface contiguous with and forming, or being attached to a separate section of the outer surface of the housing 1. The separate floats 3 are mounted so that they move radially outwardly when a valve 10a, controlled by a button 10 operable from outside the housing 1, feeds air from the tank 2 to inflate air bags 11 mounted between the float 3 and the air tank 2 to provide additional buoyancy and support on the water surface especially in rough seas or bad weather, as shown in Figure 6. The floats 3 are retractable by suitable springs (not shown) when a second button 12 is pressed to cause dumping of the air in the bags 11 via a second valve (not shown). In an alternative, simpler version of the system, the floats 3 may be fixed and immovable within the housing 1.

The housing 1 has circumferentially spaced regions around its periphery that are cut away. Handles 13 extend across these regions e.g. between the extensible floats, to allow easy carrying of the assembly, and to provide support for the user when they surface.

The device can be supplied with suitable air line systems to support 2 or 3 users for specific purposes, such as for SCUBA training purposes to allow trainees to become accustomed to breathing underwater without suffering the encumbrance of the air supply tank, or for sub-surface rescue where one mouthpiece regulator may be replaced by a regulator connected to an orinasal (breathing mask) for use by the person being rescued. The air tank 2 may be filled with sufficient compressed air to

provide air for a single diver for about 2 hours before recharging is required. However, it will be appreciated that when multiple or branched air lines 7 are used to support multiple users the air supply will be expended more quickly. A pressure gauge 14 is mounted on the housing 1 to provide a visible indication of the air pressure in the tank 2.

An alternative embodiment of the device will now be described with reference to Figures 7 to of the accompanying drawings. The assembly is the same as that described with reference to the first embodiment with the exception that the air line or lines 7 are deployed from the housing 1 in a different fashion. Instead of being rotatable, the portion 5 is releasable from the housing 1 and drops away from it in response to operation of a release mechanism 20 so that the coils of the air line are quickly and completely freed from the housing 1. This version is more appropriate when the assembly is to be used as an emergency life saving aid as the air line 7 is released very quickly and does not need to be unwound from the housing 1.

As can be seen from Figure 7, the rotatable portion 5 is replaced with a releasable base plate 21 beneath which the air line or lines 7 are coiled within the housing 1. The base plate 21 is loosely mounted to the housing beneath a lug 22. Two further lugs 23 can also be seen in the Figures. However, the base plate 21 is cut away in the region of these lugs 23 so that the base plate 21 can drop away past them. The release mechanism 20 is located radially opposite the lug 22. The three lugs 22, 23 together form feet to support the housing 1 on a flat surface. The construction and operation of the release mechanism 20 will now be explained with particular reference to Figure 8.

The release mechanism 20 comprises a lever 24 pivotally mounted on the housing 1. The lever 24 has a button part 25 extends partially up the side of the housing 1 and a base plate retention part 26 extending beneath the housing 1 and terminating in a groove 27. The base plate 21 is formed with a corresponding protruberance 28 which locates in the groove 27 to retain the base plate 21 mounted to the housing 1. The lever 24 is biased into the rest position shown in Figure by a spring element 29 mounted on the housing 1 and which engages a rear surface of the button part 25. A

safety release pin 30 is also provided to prevent inadvertent operation of the release mechanism 20. The pin 30 extends through an aperture 31 in the housing 1 and locates in an opening 32 in an upper region of the button part 25 thereby preventing movement of the lever 24. The upper end of the pin 30 is formed with a loop 33 to which a length of cord (not shown) may be attached to tie the pin to another part of the housing 1 to prevent it from being lost when removed from the aperture 31.

When the air line 7 is to be released, the user removes the pin 30 by pulling it from the aperture 31 in the direction indicated by arrow A in Figure 9. Next, they depress the button part 25 sufficiently hard enough to overcome the bias provided by the spring element 29. This causes the base plate retention part 26 to pivot so that the protruberance 28 is no longer seated in the groove 27. The base plate 21 is now free to drop away from the housing 1, as shown in Figure 9, thereby releasing the air lines 7 from the storage compartment in the housing 1.

A further cord (not shown) may be provided between the base plate 21 and the housing 1 to prevent loss of the base plate 21 when released from the housing 1.

It will be appreciated from the foregoing that the sub-aqua breathing system of the present invention provides a highly portable, easy to use device. As it floats on the water surface, the diver is unencumbered by a compressed air tank on his back and so has considerably more freedom. The size and weight of the device is also much less than with conventional SCUBA gear.

While particular embodiments of the invention have been described above it will be clear that alternative forms of construction would occur to those skilled in the art, such alternatives are intended to be within the scope of the invention which is defined by the following claims.

Claims

1. A sub-aqua breathing system comprising a housing containing buoyant material and a toroidal compressed air tank, said tank being connectable to an air line feeding a mouthpiece regulator.

2. A sub-aqua breathing system according to claim 1, wherein the buoyant material is disposed in regions around the periphery of the toroidal compressed air tank.

3. A sub-aqua breathing system according to claim 1 or claim 2, wherein the housing includes a storage compartment for an air line when not in use.

4. A sub-aqua breathing system according to claim 3, including a base rotatably mounted to the housing to cover the storage compartment and having at least one opening therein for the passage of an air line from the storage compartment through the base.

5. A sub-aqua breathing system according to claim 3, including a base and a release mechanism for releasably mounting the base to the housing over the storage compartment.

6. A sub-aqua breathing system according to claim 5, wherein the release mechanism is a lever pivotally mounted to the housing, the lever and base including cooperating means that engage to retain the base on the housing.

7. A sub-aqua breathing system according to claim 6, wherein the release mechanism includes spring means to bias the lever into a position in which the cooperating means are in engagement.

8. A sub-aqua breathing system according to claim 6 or 7, wherein the release mechanism includes a safety release pin that cooperates with the housing and the lever to prevent inadvertent operation of the release mechanism.

9. A sub-aqua breathing system according to any of claims 3 to 8, including at least one air line coiled within the storage compartment, the or each air line having one end connected, via an air flow control valve, to the toroidal compressed air tank.

10. A sub-acqua breathing system according to any preceding claim, wherein a removable cover is mounted on the housing to provide access to the interior thereof.

11. A sub-aqua breathing system according to claim 10, wherein the housing contains a mast with a diving pennant attached thereto, the mast being removable from the housing and mountable in a socket thereon.

12. A sub-aqua breathing system as claimed in any preceding claim wherein the buoyant material is formed from a number of circumferentially spaced floats the system including means for radially deploying the floats from the housing.

13. A sub-aqua breathing system according to claim 12, wherein the deployment means includes an air bag associated with each float and inflatable in response to operation of a manually operated valve to direct air from the compressed air tank to the air bags to radially deploy the air bags from the housing.

14. A sub-aqua breathing system as claimed in claim 13, wherein the floats are attached to spring means operable to retract the floats in response to operation of a second manually operated valve to expel the air from the air bags.

15. A sub-aqua breathing system according to any preceding claim wherein the housing has a discus-like shape.

16. A sub-aqua system according to any preceding claim, wherein a light is mounted on the housing.

17. A sub-aqua system according to any preceding claim, wherein the housing forms a sealed unit such that air trapped within the housing and surrounding the toroidal tank provides additional buoyancy thereto.

18. A sub-aqua breathing system substantially as hereinbefore described with reference to the accompanying drawings.

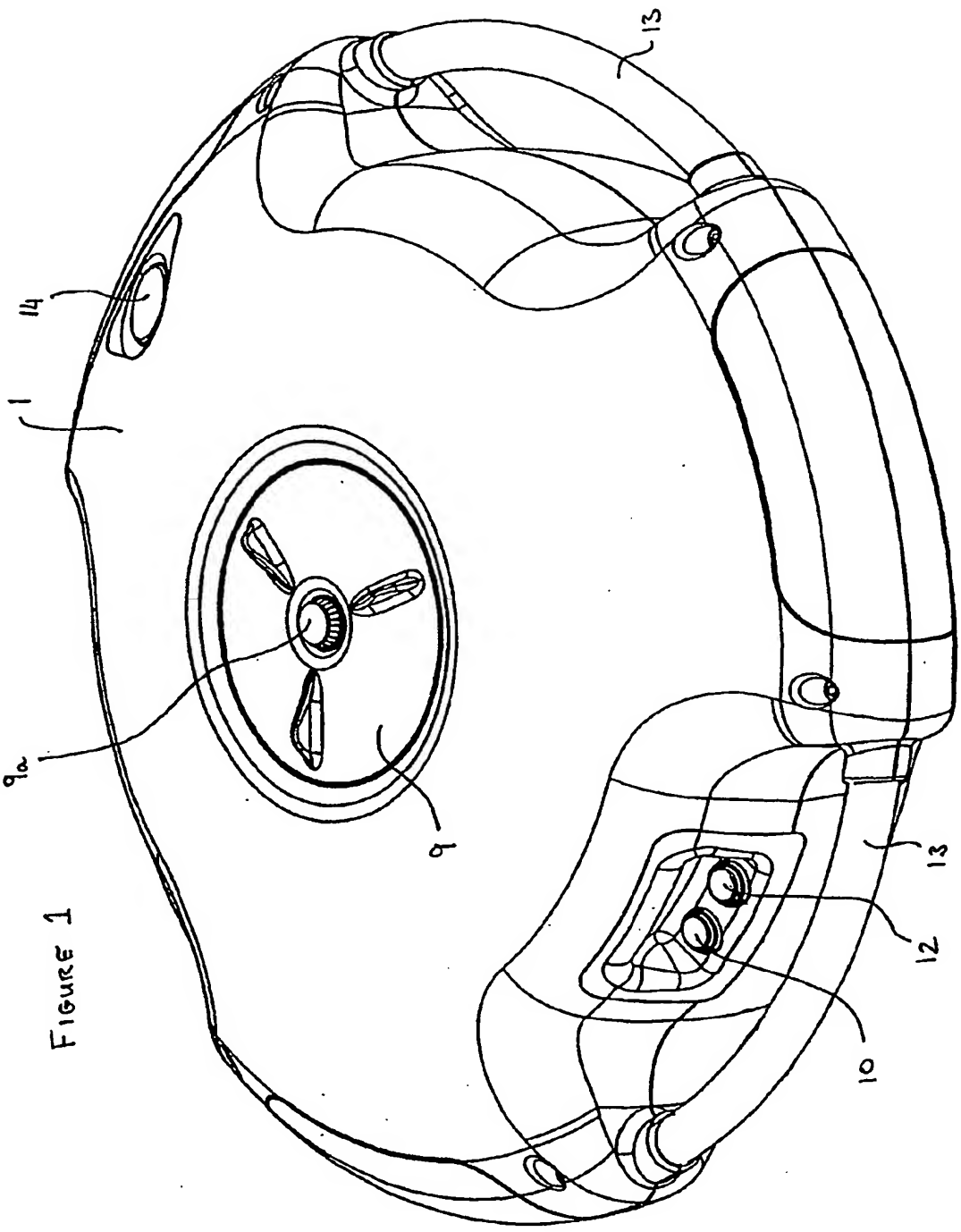


FIGURE 1

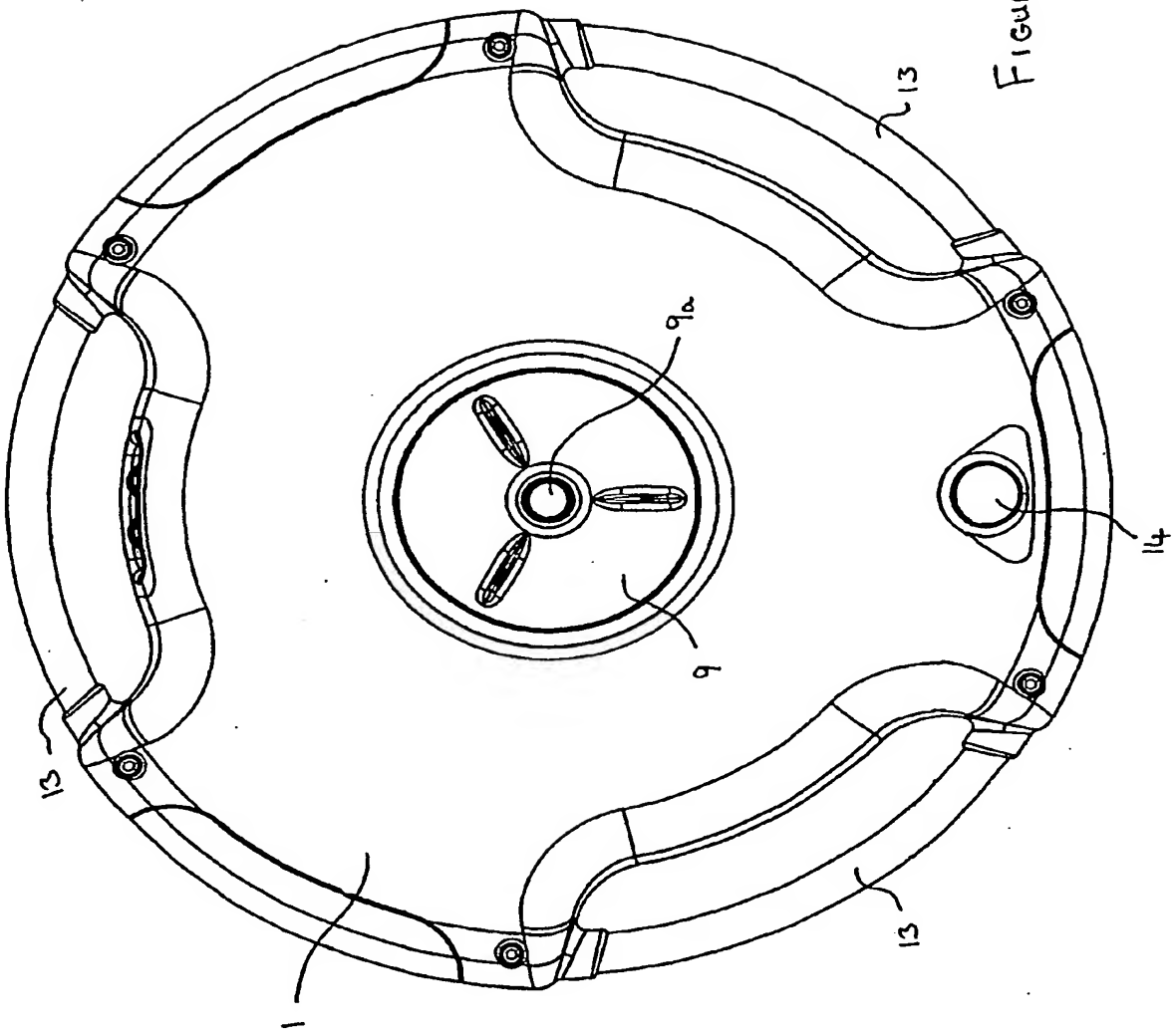


FIGURE 2

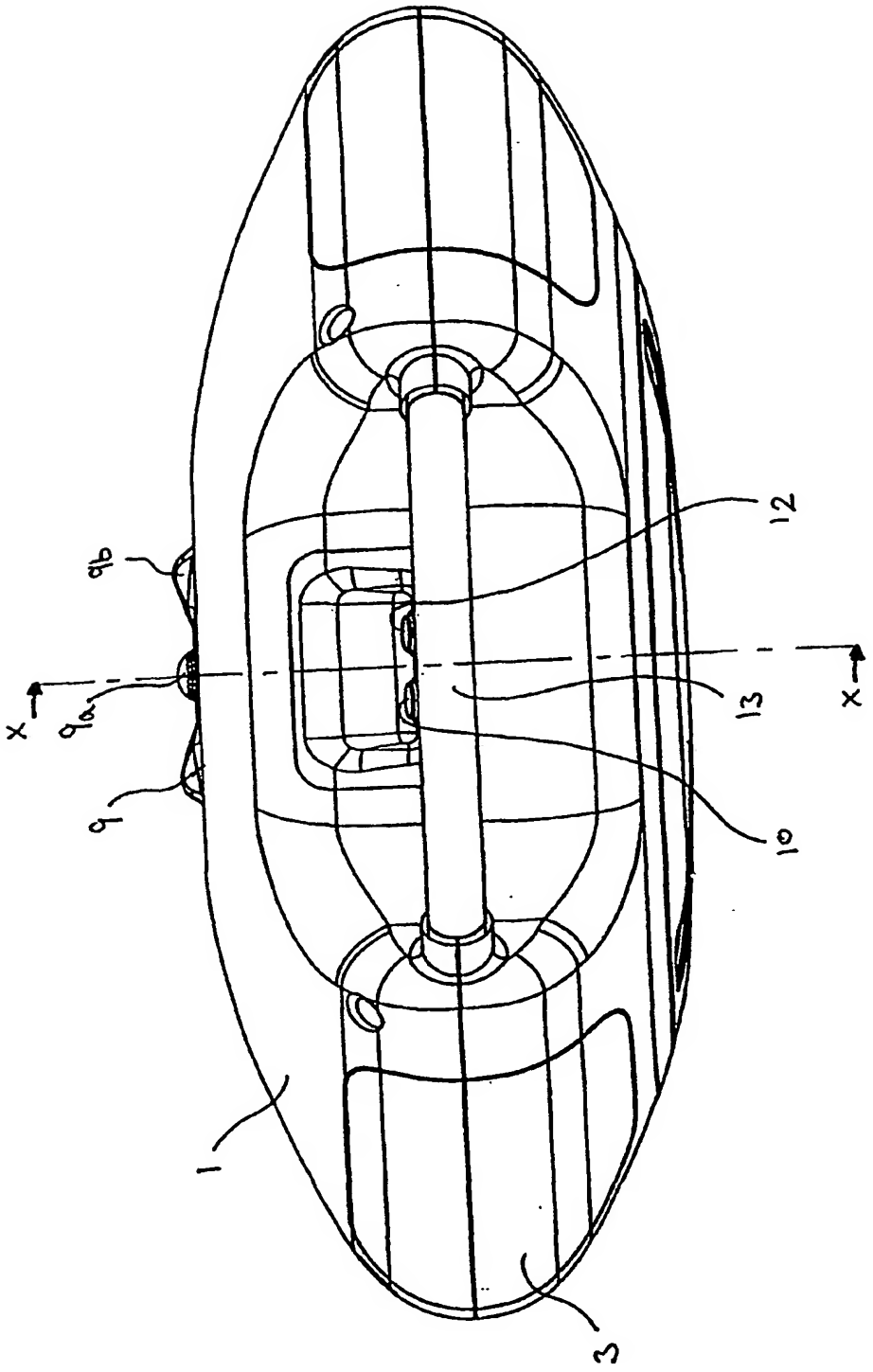


FIGURE 3

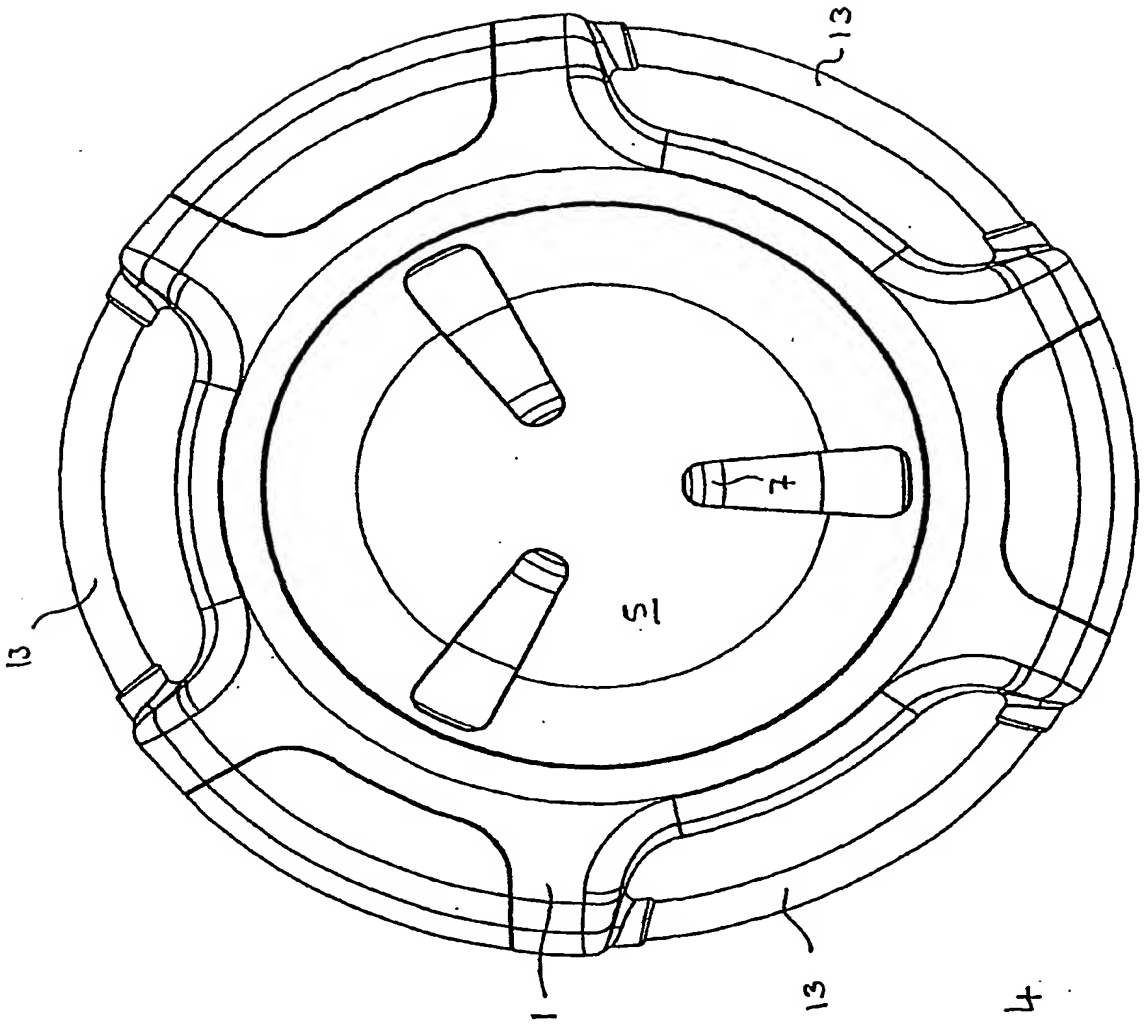


FIGURE 4

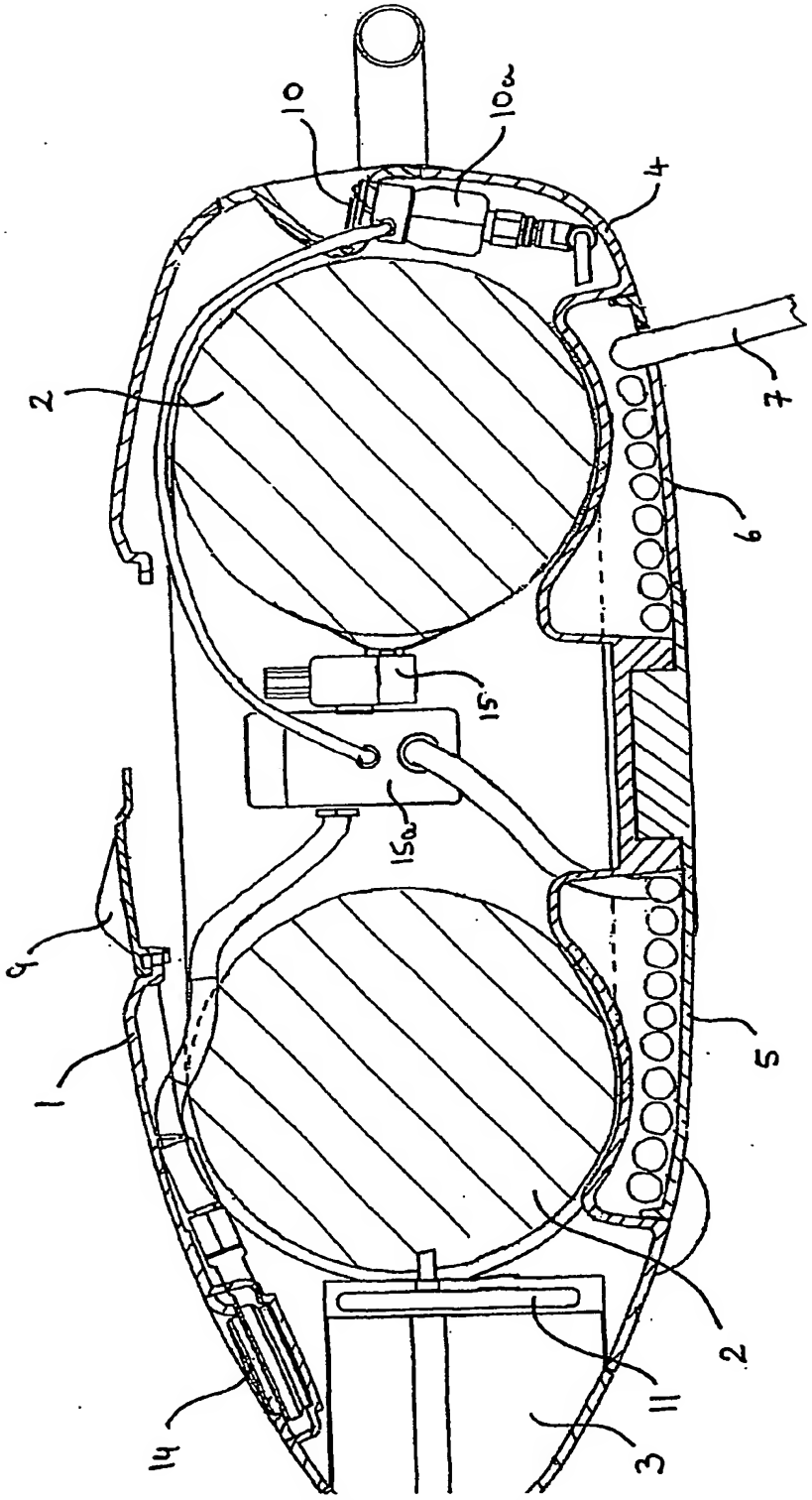


FIGURE 5

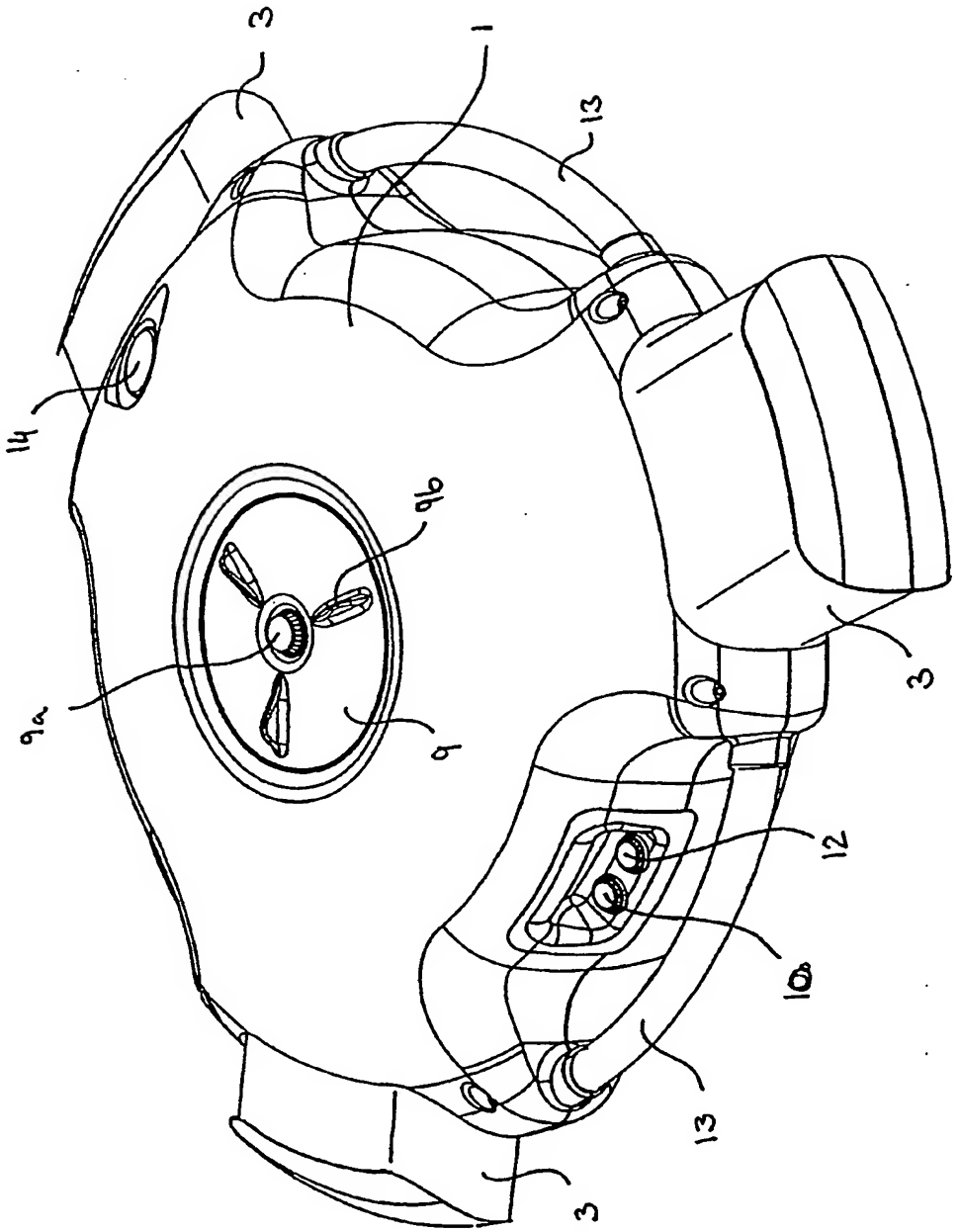


FIGURE 6

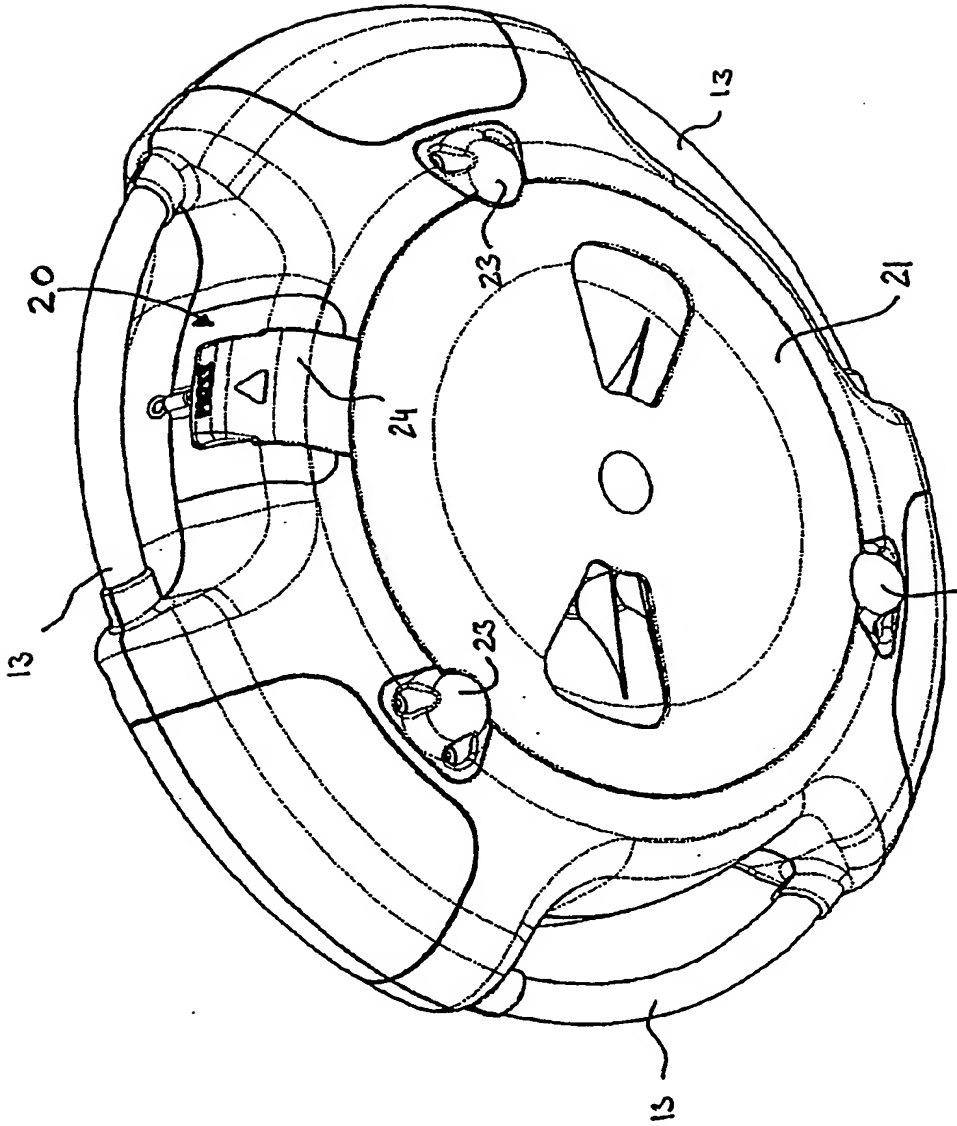


FIGURE 7

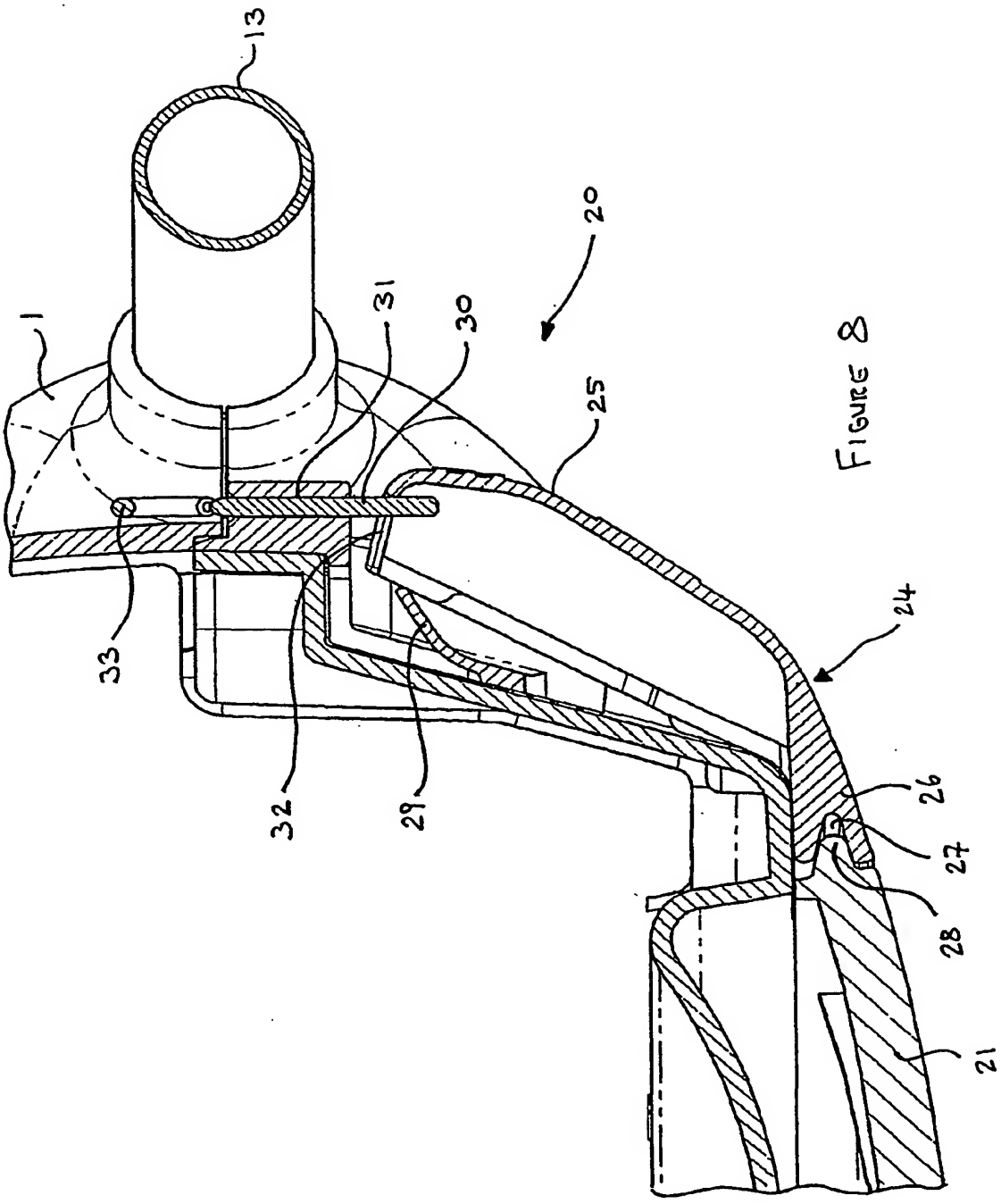


FIGURE 8

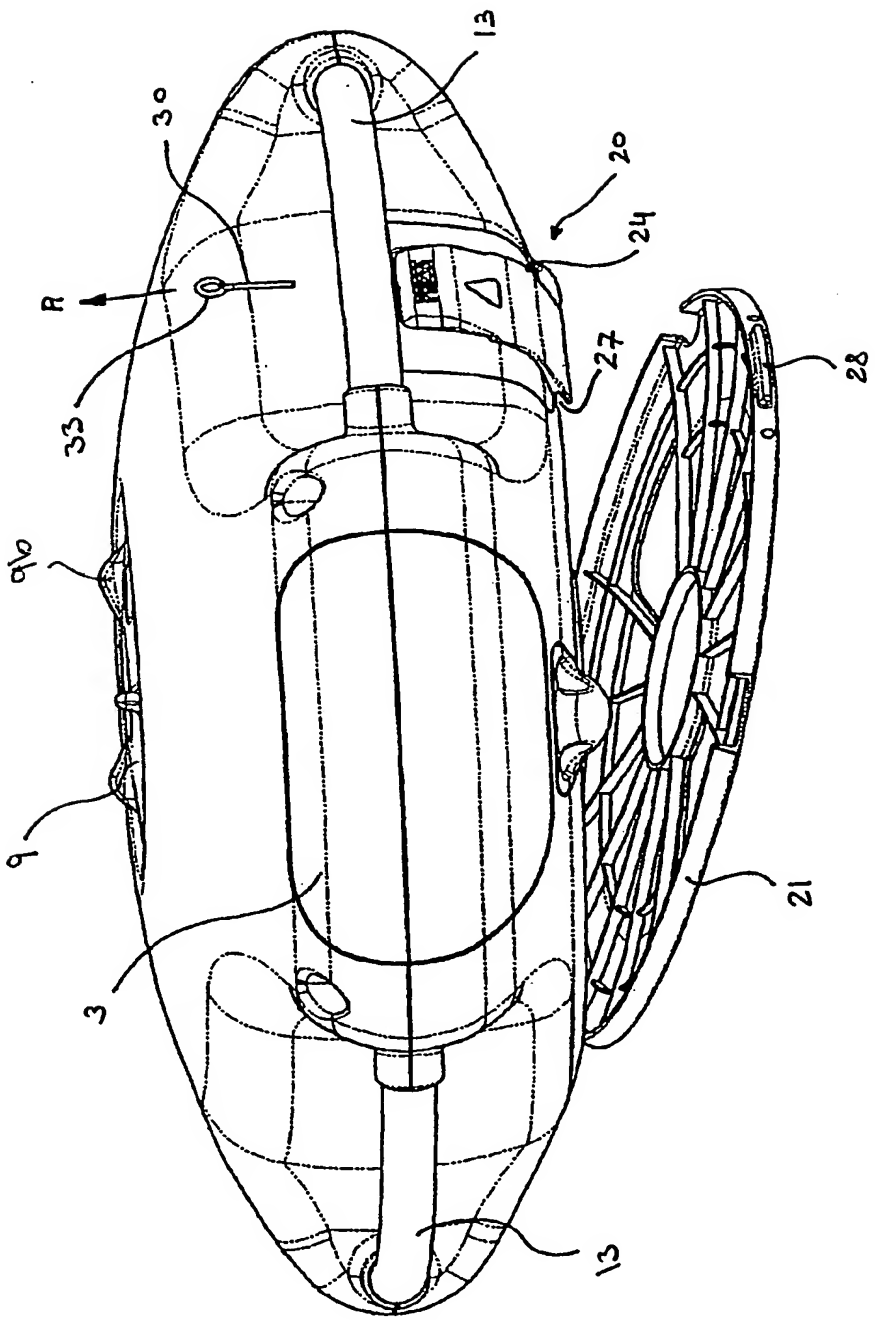


FIGURE 9

INTERNATIONAL SEARCH REPORT

PCT/GB 02/02271

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 B63C11/20

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 B63C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 1 608 264 A (GERMANO FIGLIETTI) 23 November 1926 (1926-11-23) the whole document	1
Y	WO 97 10991 A (TAELMAN THOMAS R) 27 March 1997 (1997-03-27) the whole document	1-18
Y	US 2 844 145 A (GEORGES BERGE) 22 July 1958 (1958-07-22) the whole document	1-18
A	US 4 986 267 A (DOSS STEPHEN F) 22 January 1991 (1991-01-22)	
A	EP 0 341 085 A (SNUBA INT) 8 November 1989 (1989-11-08)	

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
4 September 2002	12/09/2002

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	De Schepper, H

Form PCT/ISA/210 (second sheet) (July 1992)

INTERNATIONAL SEARCH REPORT

information on patent family members

PCT/GB 02/02271

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 1608264 A	23-11-1926	NONE	
WO 9710991 A	27-03-1997	WO 9710991 A1	27-03-1997
US 2844145 A	22-07-1958	NONE	
US 4986267 A	22-01-1991	NONE	
EP 0341085 A	08-11-1989	US 4919631 A	24-04-1990
		AU 623638 B2	21-05-1992
		AU 3178489 A	09-11-1989
		DE 68908463 D1	23-09-1993
		EP 0341085 A1	08-11-1989
		JP 2041970 C	09-04-1996
		JP 3014784 A	23-01-1991
		JP 7055676 B	14-06-1995